

## Research Article

### Current Status and Future of Sports Food

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**Abstract:** According to the need of the popularization of sports nutrition knowledge and promoting of our country sports nutrition needs, the study expounds the new concept of sports nutrition food, the development of sports nutrition food abroad, the prospect of the domestic market and the status quo of cultivate. Sports nutrition food system which has been basically in more than a decade in domestic is made a detailed elaboration and an introduction of product research and development has been made. The evolved industry standards, sports nutrition food industry, sports nutrition knowledge popularization, academic exchange domestic and overseas and sports nutrition training of our sport nutrition food industry in the past two years are all expounded in this study. These big good situations indicate the better future of our country's sports nutrition food market.

**Keywords:** Food nutriology, market, research achievements, sports food, sports nutrients

#### INTRODUCTION

Sports can be divided into two categories in general; these are competitive sports and the national fitness. In the development of competitive sports until today, sports performance is getting more and more close to the body's ability to limit. If you want to create a new performance, it must be engaged in more than the limit of training. Sports nutrition food becomes the athletes training and competition of the powerful nutrients. Under the guidance of "national fitness program outline", fitness exercise vigorously in our country, sports population (for not less than 3 times a week, every time not less than 30 min of moderate-intensity physical exercisers) has more than 400 million (2002). Which don't adapt to this is that because of the lack of reasonable nutrition guidance, making people only know sports fitness, but don't know how to use sports nutrition supplements to ensure the best of health and the fitness effect. No matter how crowd the athletes are, popularize knowledge of sports nutrition, sports nutrition food market will become the top priority. Sports nutrition food is related to the movement of a kind of special food, its development is rapid which can be said to have been popular in the world. However, there aren't consistent definitions of sports nutrition food in countries around the world, so that sports nutrition food has become a relative concept. In order to promote the healthy development of sports nutrition food industry in our country, we have already started to establish a "sports nutrition food industry standards". It is defined in this standard: sports nutrition food is used for athlete, sports exercise groups, manual laborers and it's also used for metabolic needs and the needs of specific nutrients made of modulation of food or

nutritional supplement, according to the special formula and special processing.

The aim of this study is to expound the sports nutrition knowledge popularization, academic exchange domestic and overseas and sports nutrition training of our sport nutrition food industry in the past two years and obtain the data to illustrate the future of our country's sports nutrition food market is become better and better.

#### METHODOLOGY

**The development of foreign sports nutrition food:** Foreign sports nutrition food in the food industry has become the youngest member, but one of the fastest growing. In the food industry's growth, sports supplements have been keeping the highest growth rates. In 1999 the total sale of sports nutrition market is \$1.77 billion and in 2000, the increase has been 9.7% than the previous year and the increase in 2001 has been 8.8% (Yang, 2004a). The growth of sports nutrition food and reducing weight food from 2001 to 2004 is at an annual rate of 10% (Yang, 2004b). As the book named "American market of sports nutrition products (fifth edition) reports", the retail sale of sports nutrition products in the U.S. in 2003 has been to \$3 billion. It includes three kinds of main products, namely:

- Supplements (tablet, capsule, powder and water)
- Drinks (including isotonic drinks, energy drinks and sports and other soft drinks, fruit juice enriched nutrients and water)
- Motion and energy bars and gel (Packaged Facts, 2004)

Janice International (Zenith International) reported that in 2003, western European sports drinks market sales have broken through 1 billion Euros, annual consumption grew by 27%, to 477 million liters. More and more athletes use sports drinks to improve exercise capacity, predicts 2008, the annual consumption will reach 750 million liters (Zenith, 2004). In 2005 the global sports drinks market annual growth rate of 10%, to 9.718 billion liters. The growth of the new products dominates the market. They effectively after hydration improve sports ability, help the muscle recovery. Electrolytes and sugar are contained in the formula and a growing number of drinks in the form of amino acids and peptides increase the protein content in beverages. Sports drinks market in the Asia-pacific region in 2005 accounted for 38% of the world. Per capita consumption sports drinks in Japan and China is at the second place only under the United States. By 2010 China will surpass Japan as the leader of the sports drink market in the Asia-pacific region (Zenith, 2006).

Foreign sports nutrition food market has more mature products of variety functional series and high degree. In the United States, sport nutrition food generally does not require to obtain FDA batch market development relies mainly on the scientific basis for the formulation of product taste and using effect, etc. In Europe and the United States the function of sports nutrition food including: energy control supplement protein, vitamins and minerals to enhance the immune function of resistance disease, antioxidant to improve joint health improvement of central nervous system. As the use of product ingredients are mainly whey protein vitamin TAU glutamine branched chain amino acids and other forms of function of different material products of diversified trends including beverage tablet powder nutrition bar, etc. Rapid growth in recent years, the sports nutrition food reportedly global nutrition giant as incomplete statistics, Herbalife's 2010 sales is \$4.3 billion. The results show that in 2010 the United States sports nutrition food market's total sales of more than \$10 billion In addition each year about \$1 billion of new products into the market this exercise fatigue resistance of nutrition of the important part. Pepsi, Gatorade has a history more than 40 years accounted for 85% of the American sports drinks. So far, the developed countries in sports nutrition food product variety, formula design and use of the effect of demand on according to the needs of different people have formed a complete system. Sports drinks in product formulations, oral liquid, powder, capsule, etc. And offer a variety of nutrients in efficiency, which can improve muscle and strength, quick to provide energy, also improve immunity, enhance antioxidant capacity, accelerate fatigue elimination, adjust the body's metabolism, protect the soft tissues and so on. They joined the nourishment of the developed herbal extracts from all over the world, the extraction process of the extract, composition and effect also has a more in-depth research.

Nutrition bar and good energy bars and other such food is of the fastest growing type of food, in 2004 the United States nutrition rods and bars of annual sales of \$838 million, increased by 169% in 1999 than. Since 2000, global food bar at 11.4%/year on average continues to grow substantially, although has amounted to \$4 billion in 2005, but according to predict 2006 will greatly exceed this level. Sports nutrition food markets mature abroad. In 51 for athletes to use sports nutrition food survey report, the male and female athletes of 10274 people are surveyed, 46% of them use of sports nutrition food. Their ages are different and they are in different levels of sport and exercise. In another report, for the survey of 100 Norwegian national athletes of different projects, 84% of which use micronutrient supplements (Yang, 2004b).

**The present situation of the domestic sports nutrition food markets:**

Taking foreign sports nutrition food market to comparison with the development level and present situation of our country, although it has a history of 20 years, it is still at the stage of enlightenment that it is not very mature. In 1984 the Guangdong Jianlibao beverage factory pioneered sports drinks containing alkaline electrolyte, once known as the "Chinese Mo Shui". Janis international reporting, sports drinks in China market in 2005 reached 1.5 billion liters, annual growth rate of 20%, far higher than global growth (Dominique, 2006). But unfortunately, the new sports drink more just to use this concept, rather than a real sense of sports drinks. At present, in sports and fitness club can only see some professional sports drinks. The drinks are in the popularity of sports and fitness, in order to solve the athletes and a lack of fitness crowd carbohydrates, water loss and physical recovery after exercise has played a positive role, but the market coverage is very narrow, far from the fashioned sports drinks market in the United States.

With the rise of the national fitness campaign across the country, our country's sports nutrition industry shows a strong momentum of development, the average annual growth rate over 90%, is nearly three times than that in the same period in the United States. According to preliminary calculations, including professional concept of sports nutrition, sports drinks and sports drinks, sports nutrition food market. In 2004, have formed the scale of the 10-1.5 billion Yuan, is expected in 2008, our country sports nutrition food scale will reach 5 billion Yuan, including professional sports nutrition food scale which will reach 1 billion Yuan. In our country since 1991 for sports nutrition food development and the function evaluation, has been more than ten years history. At present, the specialized agencies engaged in sports nutrition research has three, namely the state sport general administration of sports medicine institute of sports nutrition research center. Medical institute of nutrition and biochemical laboratory

of Peking University and Beijing institute of sports nutrition health bit. In a number of sports nutrition food development and assessment at the same time, also gradually formed a set of relatively complete evaluation system of our country health care products industry emerged in the 1980 s, the mid-90-s health care products market is the most prosperous and the development momentum has been up and down. Heyday, the production of health products up to more than 3000 enterprises, 28000 kinds of products, sales reached 30 billion Yuan. And when in the trough, the enterprise was reduced to about 1000, selling only about 10 billion Yuan (Li *et al.*, 2005). In July 2006, the company invest in the construction of health bit "sports nutrition industry base" completed and put into production. The collections of technology research and development, product production, information acquisition, detection, evaluation and education training are body comprehensive sports nutrition industry base. Industry base will be the integration of sports nutrition industry upstream and downstream enterprises "incubator" industry, industrial base is put into use in our country to the industrialization of sports nutrition industry plays an important role in direction. The 2008 Beijing Olympic Games and the national fitness movement in our country, the development of sports nutrition industry provides a good opportunity.

Among the 27 items of food functions set by health food administrative departments in China, only enhancing immune, antioxidant, improving sleep, relieving physical fatigue, improving the ability to resist hypoxia tolerance and improving nutritional anemia and other six functions are related to movement. That is to say only 6 of this kind of health food have the potential to be sports nutrition food. Even within these only six functions the scope of large food enterprises also didn't pay enough attention to, not to mention the long technology and R and D investment. The marketplace have been occupied by a handful of domestic specializes in sports nutrition of the food research and development. And production enterprises which are limited to professional sports teams and fitness club are far away from satisfying the demand of our country's more than 400 million fitness crowd. It can be said that Chinese sports nutrition food market is a huge potential "virgin land", looking forward for insight men to develop and cultivate (Wang *et al.*, 2004; Jia, 2004).

**The further study on the functions and components of sports nutrient drink:** In recent years, research has shown that many plant sources of protein enzyme solution to obtain active peptide, such as peanut polypeptide, soybean peptide and corn peptide is better than the original protein functional properties. The experiment also confirmed that the peptide absorption rate is higher than amino acids, amino acids than easier,

faster absorption by human body through the small intestinal mucosa using. During the movement process of branched chain amino acid oxidation in the body energy accounted for about 60% of the total amino acid power, branched chain amino acid supplements for long time intensive sports aerobic process provides material basis for repair and restore damaged muscle to save other amino acid consumption improving the nitrogen retention in the body to keep athletes abundant. Physical strength and good form Glutamine peptide is a variety of proteins in the body and the immune function of the important regulatory factor supplement glutamine peptide which can relieve stress state under the structure of intestinal mucosa injury and improve the study. It's confirmed that the peanut polypeptide has function of intestinal mucosa antioxidant immunity and lower blood pressure. The right amount of mineral is an essential part of sports nutrition food it can complement movement caused by sweating in potassium sodium and electrolyte loss also help a lot of water to stay in the blood vessels to make the body gets more hydrated. Adding B vitamins into sports nutrition food can promote energy metabolism vitamin C so as to remove free radicals to reduce its harm to delay the onset of fatigue of the body the right amount of TAU and inositol can promote the synthesis of proteins prevent protein decomposition of regulating metabolism to accelerate the elimination of fatigue and so on.

On the active substances of food for sports in recent years, the research on the application of which is very active. Many active substances were found to have anti-fatigue activity can be used in sports nutrition food. At present, many plants have been found and the sources of microbial polysaccharides have anti-fatigue effect. Such as seaweed polysaccharide can significantly improve participants' weight loading swimming time in mice and prolong the survival time of mice under normal pressure hypoxia. And it also promote the mice ox hemoglobin dissociation and oxygen release improve hypoxia mice used for oxygen and enhance the capacity of anti-fatigue and hypoxia tolerance of mice (Liu *et al.*, 2003). Spiral alga can enhance lactate dehydrogenase activity in mice; reduce blood lactic acid levels in mice after exercise, the body to enhance the tolerance of fatigue (Ciferri and Tiboni, 1985). Jujube is polysaccharide and can significantly increase the mice muscle glycogen and liver glycogen reserves, increase after exercise lactate dehydrogenase activity, has the anti-fatigue function (Zhang and Wu, 2006). According to the 2 comprehensive study the above on the functions and components of sports drinks, it isn't hard to see that the application of polysaccharides these active substances, in recent years has been extensively developed, in addition to the traditional polypeptide amino acid, sugar, fat, minerals, vitamins, flavonoids in sports nutrition food. In recent years, it has been extensively developed

and we believe that with the deepening of the research more active substances can be applied to sports nutrition in the food, to benefit the general population crowd.

**The problems existing in Chinese sports nutrition drink:** Overall sports nutrition food in our country, there are the following questions:

- With foreign sports nutrition food market, compared to the status quo and the development level of our country although also has 20 years of history, but overall is still in its infancy, in addition to develop more anti-fatigue effect component mining and evaluation and other herbal medicine food homology material and fatigue research, innovative research is not much.
- Have not strictly accorded to our country sports population movement status of gastrointestinal digestion and absorption characteristics to design, copying foreign race nutrition easy cause physical discomfort, nervous stomach cramps, collecting utilization rate is low.
- On the market at present sports nutrition food with nutrient monomer preparation, is lack of food flavor and taste is not good, which is easy to cause psychological rejection.
- The nutrients of some food are relatively single, especially some sports drinks contain sugar, only a few vitamins and minerals and long-term consumption can cause human body nutrients balance disorders. As scientific research institutions and production enterprises related to sports nutrition food have deepen understanding the problem of industry, the problems of sports nutrition food in our country will be gradually solved, the sports nutrition food suitable for our country sports population gastrointestinal digestion and absorption characteristics will continually push forward markets.

**Prospects of the development of domestic sports nutrition food:**

**Domestic sports nutrition food system has been basically mature:** Our country sports system began to develop sports nutrition food and functional evaluation since 1991. At present, there has gradually formed a set of relatively complete classification of sports nutrition food and functional assessment system. The two systems will make the sports nutrition food meets the need of human movement and increase the efficiency of the movement and the safeguard health role. The classification and the function evaluation systems of sports nutrition food according to the nutritional ingredients and add the functions of sports nutrition supplements can be divided into three categories:

- The sports nutrition supplements
- Sports nutrition powerful agent
- Human movement state regulator (Yang, 2004b)

**Sports nutrition supplements:** The needs of athletes and people engaged in sports for a variety of nutrients, such as carbohydrates, protein, vitamins, inorganic salt and water and so on are higher than that of people who are not engaged in sports. When dietary nutrition can't satisfy the body in quantity, type and complement the requirements on the time, these nutrients supplements has become the indispensable nourishment.

## RESULTS AND DISCUSSION

**Merits of agent-oriented modeling:** Agent is an advanced computing, if we compare with the traditional numerical analysis method. It not only provides modeling methods, but also gives solution of the problem. In particular, agent-oriented system may deal with complex interactions between environment and the robot. Now more and more people think that the intelligence of robot is increased in these interactions.

In order to achieve maximum exercise capacity, regular people engaged in sports add sugar before, during and after in the sports, to ensure that the energy supply and the muscle glycogen re-synthesis after exercise.

The need of exercise body's for protein is more than those who do not exercise, just from dietary intake of protein and into the excess fat. Protein and amino acid supplements become one of the sports population sources of protein. In addition, immediately after exercise supplement, amino acid supplements will also accelerate the recovery of muscle; restores the physical strength can help improve the efficiency and speed of movement. Commonly used protein and amino acid supplements are: plant protein powder, egg powder, amino acid (single and composite or branched chain amino acids) and polypeptide preparation, etc. At present, the research is the most active polypeptide preparation, because it has the highest activity, absorbed and used quickly. The research and application of peptides have been in the international advanced level (Li and Yang, 2003; Wang and Lin, 2006).

Athletes, especially in the great physiological load of exercise training of athletes for a long time of vitamin and inorganic salt requirement are higher than the average person. Currently used in the sports team is more than protects, it is according to the athletes' daily vitamin and inorganic salt loss, more in line with the actual needs of the athletes.

Strong nutrition agent is actually some highly purified and concentrated nutrients. Powerful agent reasonable nutrition supplement will help enhance the metabolism of the body's different organs and tissues of athletes, to excavate the body's biggest potential, combined with high strength and great physiological load of exercise training, can improve the effect of sports ability, to guarantee effect to the athletes training and competition.

Increasing the nutrition muscle size and contraction force powerful agent will increase muscle size and contraction force mainly including two kinds of materials:

- As raw materials for the muscle protein synthesis of high biological activity of high quality protein and amino acid.
- Promote the synthesis of muscle and improve muscle contraction ability of material, preparation of traditional such as methyl-guanidine acetic acid, Chinese medicines notifying kidney, chromium, zinc, boron, vitamin C, etc.

Dietary supplements to promote energy metabolism in competitive sports and the national fitness movement and promote the efficiency of energy metabolism and stimulate energy generated supplements is the guarantee of the ability of sports and the health of the conventional "weapons", have been favored by people and attention. They include: sugar, methyl-guanidine acetic acid, 1, 6-two Diphosphate Fructose (FDP) and other powerful nutrients, such as methyl-guanidine acetic acid, pyruvic acid salt, fatty acid, etc. To accelerate the elimination of fatigue after training and physical recovery nutrition strong athletes to make achievements, must be continuous ultra-physiological limits under the great physiological load of exercise and strength training and the recovery after training has become the key to the training task to complete. Fitness people with good fitness after exercise into the working state also need to use strong nutrition agent. Eliminate fatigue, restore physical methods are:

- The system fill sugar
- The use of antioxidant and enhance the immune ability of glutamine (now commercially available nutritional health products have a "strong recovery granule", "omnipotent granule", glutamine capsule, etc.), vitamin E, vitamin C, life red element (lycopene), 1, 6 Diphosphate Fructose (FDP). They used the traditional Chinese medicine health care products, etc

Athletes, control weight reduction period of special supplement control weight and lose weight fast before the game, except through dietary individualized intervention also use weight series food at the same time, they include: magic crisp, slimming rods, electrolyte vitality capsule and the sprint energy pump, etc. They can make the athletes will cut down weight, according to the schedule and ensure the player with the best competitive state in the (Yang and Jiao, 2000).

## CONCLUSION

The 2008 Olympic Games to be held in Beijing and China's national fitness movement have unlimited business opportunities for the sports nutrition industry. Over the past 2 years, our country sports nutrition food

with rapid advance in the field of work, they include the development of sports nutrition food and standard formulation. Sports nutrition food research institute of development, the development and the demand of the market with the enterprise together, greatly improve the technological content of sports nutrition food. At the same time, under the leadership of the national standardization technical committee of food industry, the relevant enterprises and experts made the first batch of sports nutrition food industry standards, the energy control food protein to supplement food, food, energy and food such as methyl-guanidine acetic acid 4 kind of sports nutrition food industry standards. It has been submitted to the national development and reform commission, waiting for release. The establishment of the four standards will greatly promote the development of sports nutrition food industry in China and the standardization of the market; it will also create conditions for the establishment of the national standard in the future:

- **The popularity of sports nutrition knowledge and academic exchanges at home and abroad:** In recent years, sports nutrition food web development is rapid; greatly strengthen the sports nutrition food knowledge propaganda. To our country sports nutrition food market development has played a positive role. 2004 and 2006, the two international top BBS of the success of the sports nutrition food, which has promotes our country sports nutrition contents of science and technology of food industry. Well-known sports nutrition food experts, scholars and entrepreneurs from China, the United States, Britain, Canada, New Zealand, Germany and other domestic and foreign presented their views engaged in the hot topics of sports nutrition food. And it has wide range of academic exchanges the frontier science and technology, sports nutrition food industry status quo and its prospect, sports nutrition food in the application of professional and amateur training and competition, the development of new resources, new technology application and sports nutrition food and problems and the 2008 Olympic Games.
- This can promote our country sports nutrition food industry development, the popularization of sports nutrition knowledge, developing and cultivating sports nutrition food market has played a positive role. Compared with the developed countries in the world, the nutritionist industry in our country is very backward. Dietitians in China at present, are nearly 4000, among this limited dietitians, tended to mid-career, professionals is very less. If according to the Japan nutritionists (300:1), the proportion of the total population will cause the lack of 4 million dietitians in our country. Even if according to the proportion of America's 4200:1, our country also lacks 300000 nutritionists (Chai and Zhao, 2004).

Sports nutrition talent is scarce in our country, except for a few sports nutrition researchers involved in the athletes' nutritional guidance work, until 2005, the number of sports nutritionists to zero. In just 1 year of time, our country has established a complete sports nutritionists training system and with the national labor and social security of China employment training technical instruction center, to the promotion of "post training sports nutritionists" work throughout the country. Sports nutritionists training courses run for a year, across the country set up 14 periods, for our country has trained more than 300 of the first sports nutritionists. They have been active in the field of competitive sports of our country and the national fitness, to promote the popularity of sports nutrition knowledge education and guidance work in China played an unprecedented positive role.

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#### REFERENCES

- Chai, W.Z. and E. Zhao, 2004. Development situation of nutrition education nutritionists in foreign countries. *Chinese Food Nutr.*, 12: 11-13.
- Ciferri, O. and O. Tiboni, 1985. The biochemistry and industrial potential of Spirulina. *Annu. Rev. Microbial.*, 39: 503-526.
- Dominique, P., 2006. Danisco Develops Innovative Sports Drink Concepts. Retrieved form: <http://www.beveragedaily.com>.
- Jia, Y., 2004. Health food-market present situation and the development thought in China. *J. Modern Health Care*, 10: 12-16.
- Li, S. and Z. Yang, 2003. Active peptide and its application in movement. *Chinese J. Sport. Med.*, 22: 174-177.
- Li, X., Q. Lin and L. Li, 2005. Current situation and countermeasures of Chinese health food market research. *J. Food Sci. Technol.*, 10: 18-23.
- Liu, F., Z. Li and Y. Pang, 2003. Arterial blood gas and the seaweed polysaccharide on mice anti-fatigue function. *J. Public Health China*, 12: 1462-1463.
- Packaged Facts, 2004. The U.S. Market for Sports Nutritional Products: Sports Drinks and Energy Bars Fueling the Couch Potato. Retrieved form: <http://www.packagedfacts.com4>.
- Wang, L. and S. Lin, 2006. The development process and prospect of health food industry in our country. *J. Modern Food Med. J.*, 16: 1-3.
- Wang, Q., S. Li and Z. Yang, 2004. Added soybean peptides on the middle-distance race athletes training period and biochemical index. *Chinese J. Sport. Med.*, 23: 33-37.
- Yang, Z., 2004a. The function of the international sports nutrition food and market development. *Chinese Foreign Food*, 5: 486-493.
- Yang, Z., 2004b. The present situation and trend of the development of the sports nutrition food in the domestic and overseas. *J. Food Ind. Sci. Technol.*, 5: 10-12.
- Yang, Z. and Y. Jiao, 2000. Athletes, reduce the scientific method of weight control and weight after the race special nutritional supplement. *J. Zhejiang Sport. Sci.*, 22: 35-38.
- Zenith, 2004. International: Zenith Report on West Europe Sports Drinks. Retrieved form: <http://www.zenithinternational.com5>.
- Zenith, 2006. International: Zenith Report: Global Sports Drink 2006 Report. Retrieved form: <http://www.okokok.com.cn6>.
- Zhang, Z. and M.D. Wu, 2006. Protective effect of jujube dates polysaccharide on chemical liver injury in mice and antifatigue effect. *J. Nanjing Agric. Univ.*, 29: 94-97.